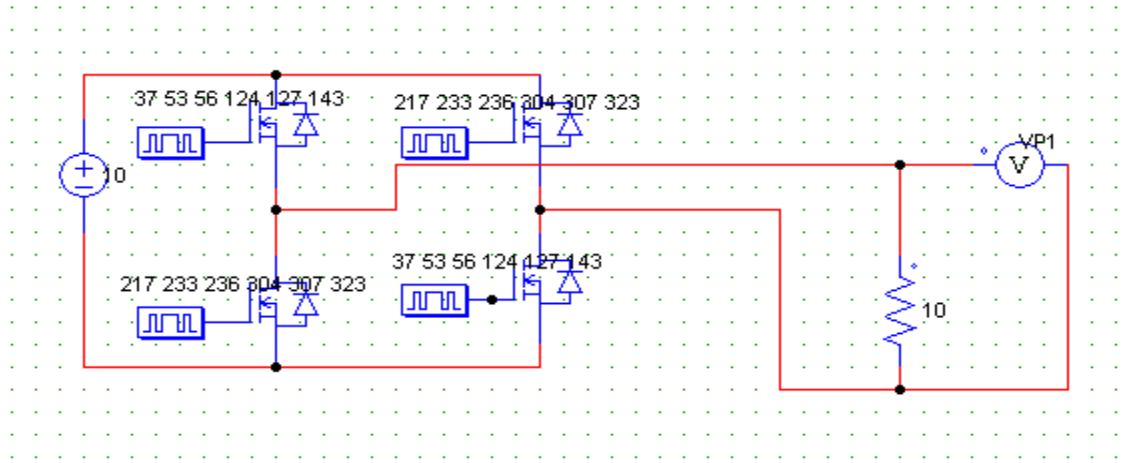
Annexure

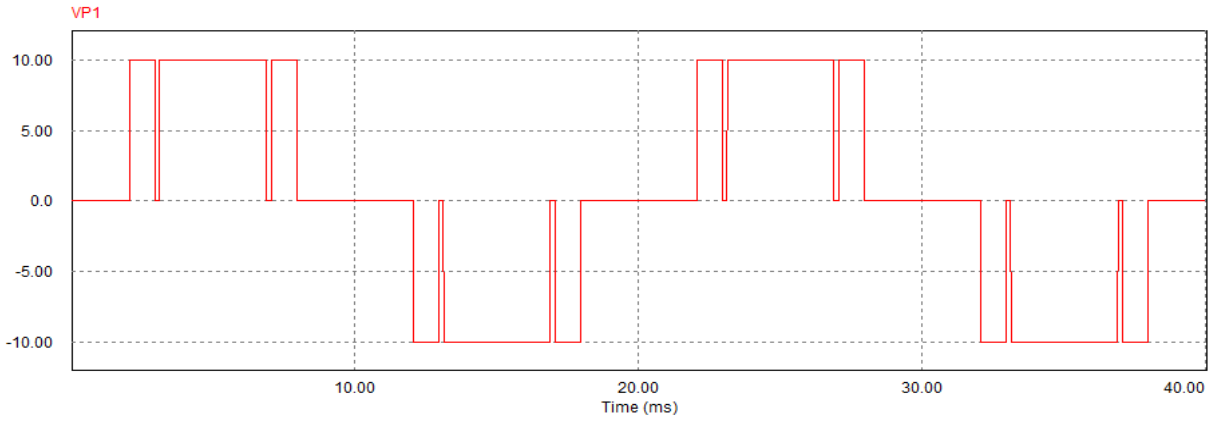
1. **Multiple Pulse Width Modulation (MPWM) :**

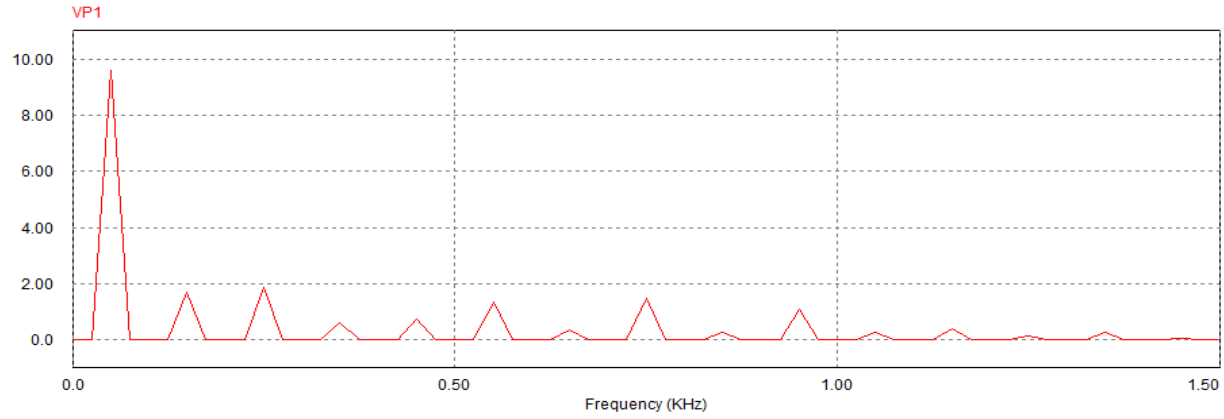
   No. of output pulses: 3 Total Pulse Width: 100^0

   A) Middle Pulse : Centre: $90^{0,}$ Width: 68^0

   Boundary Pulses: Centre: 45^0 and 135^0, Width: 16^0 each.

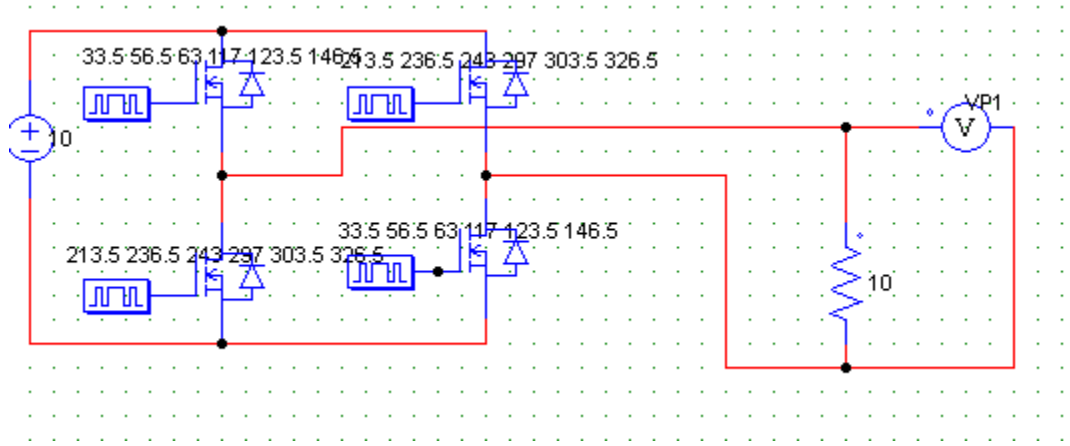


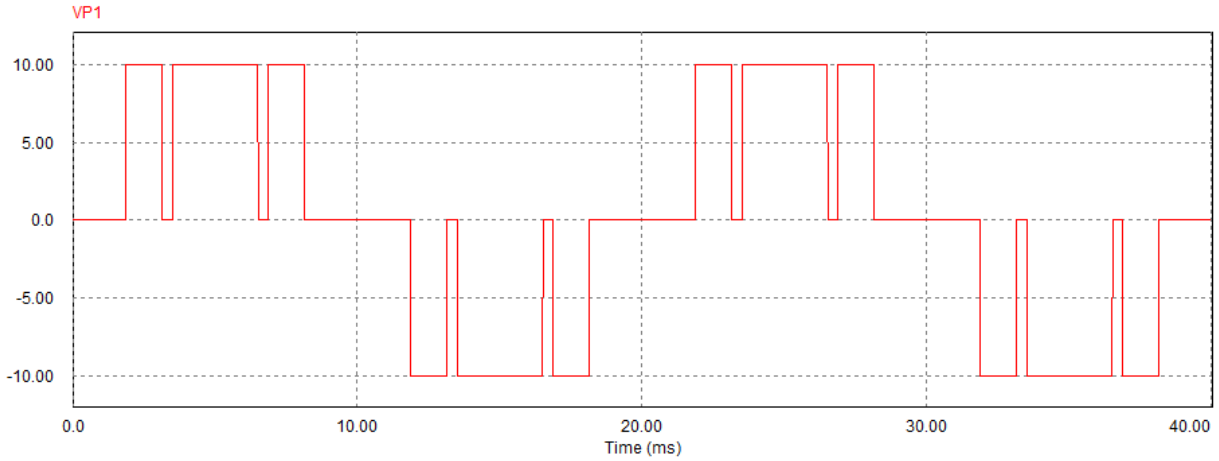


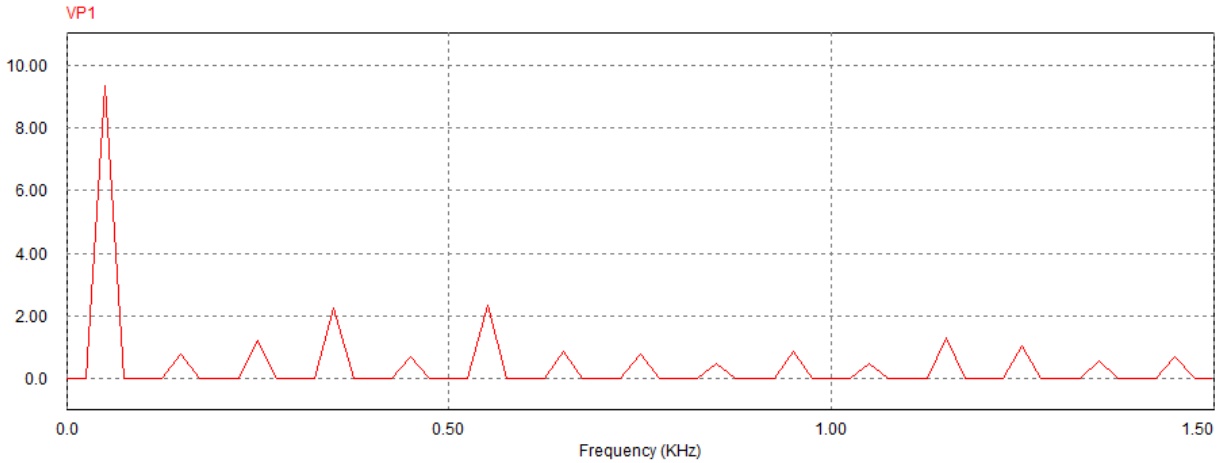


B) Middle Pulse : Centre: $90^{0,}$ Width: 54^{0}

Boundary Pulses: Centre: 45^{0} and 135^{0}, Width: 23^{0} each.

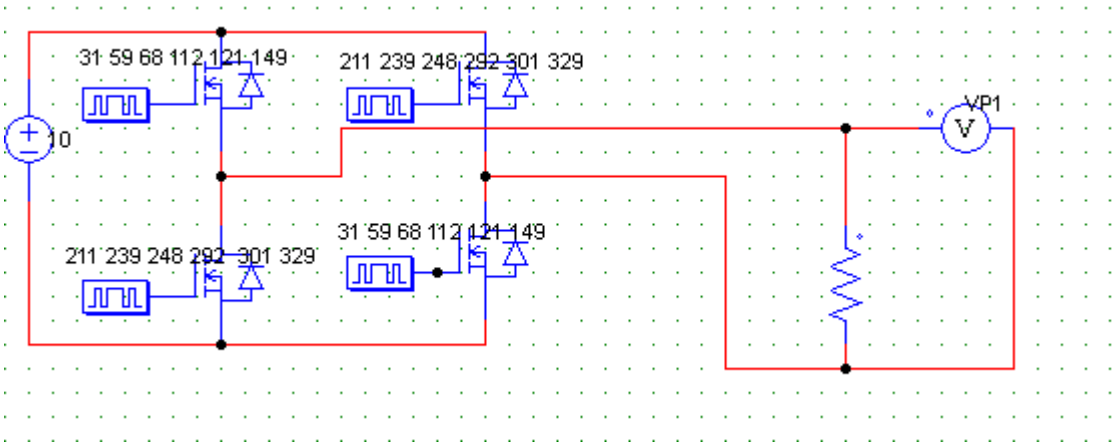


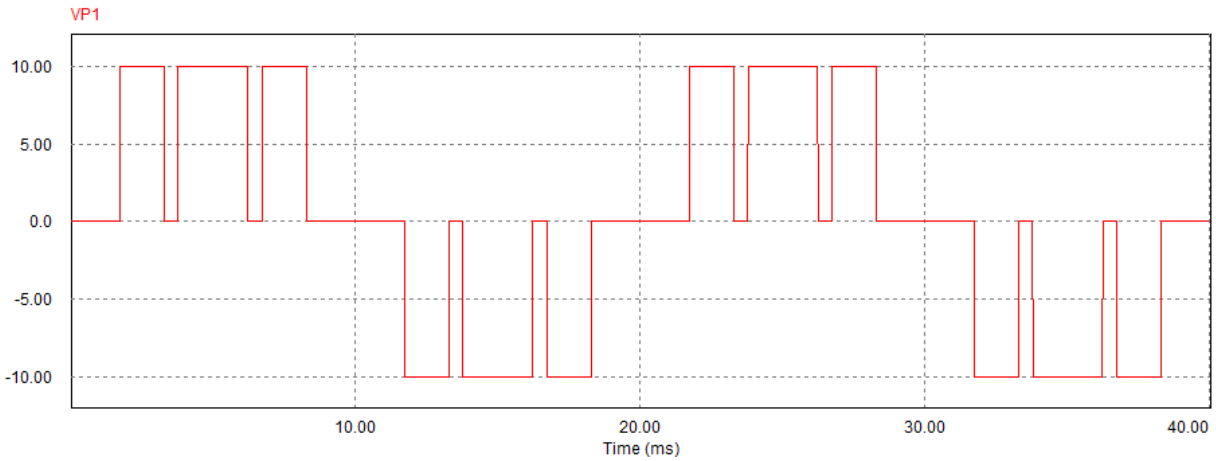


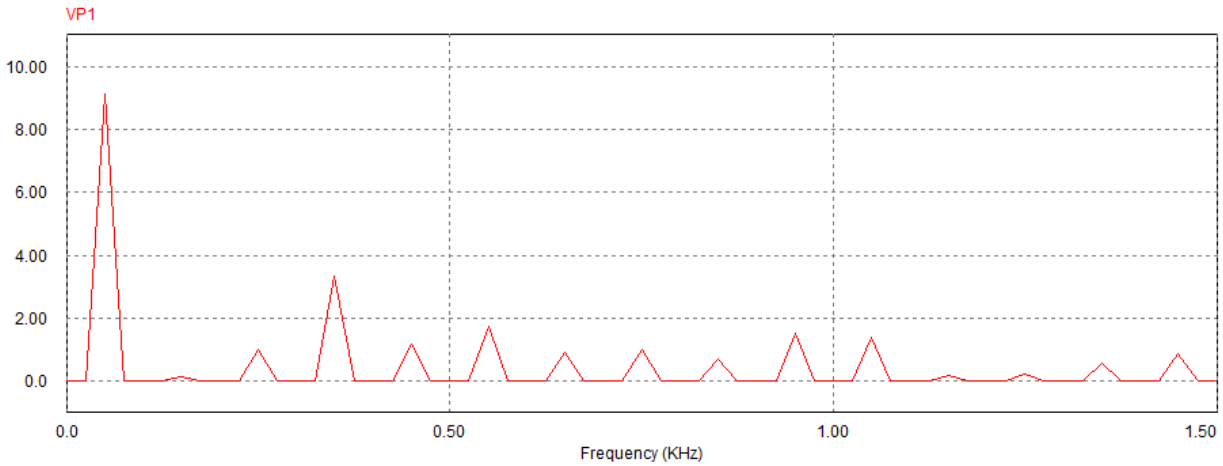


C) Middle Pulse : Centre: $90^{0,}$ Width: 44^{0}

Boundary Pulses: Centre: 45^{0} and 135^{0}, Width: 28^{0} each.

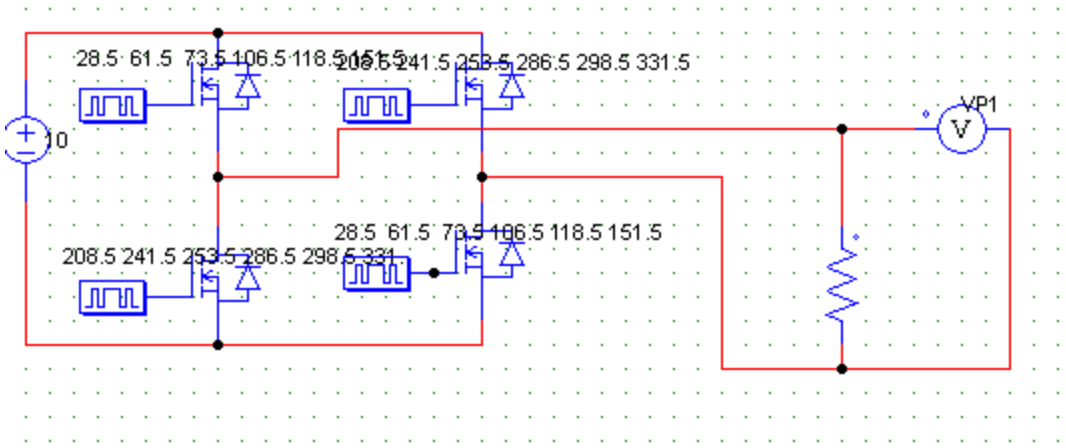


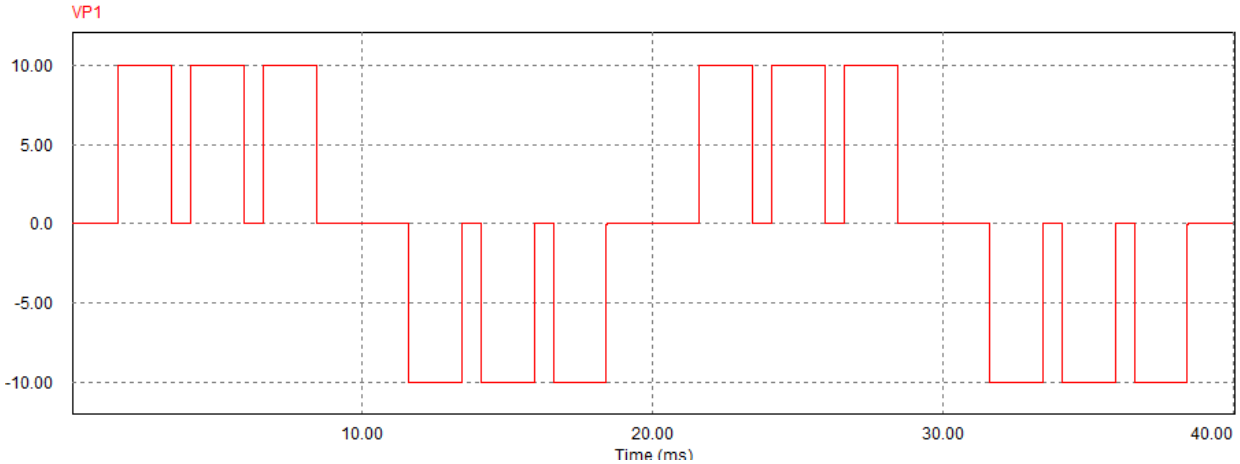


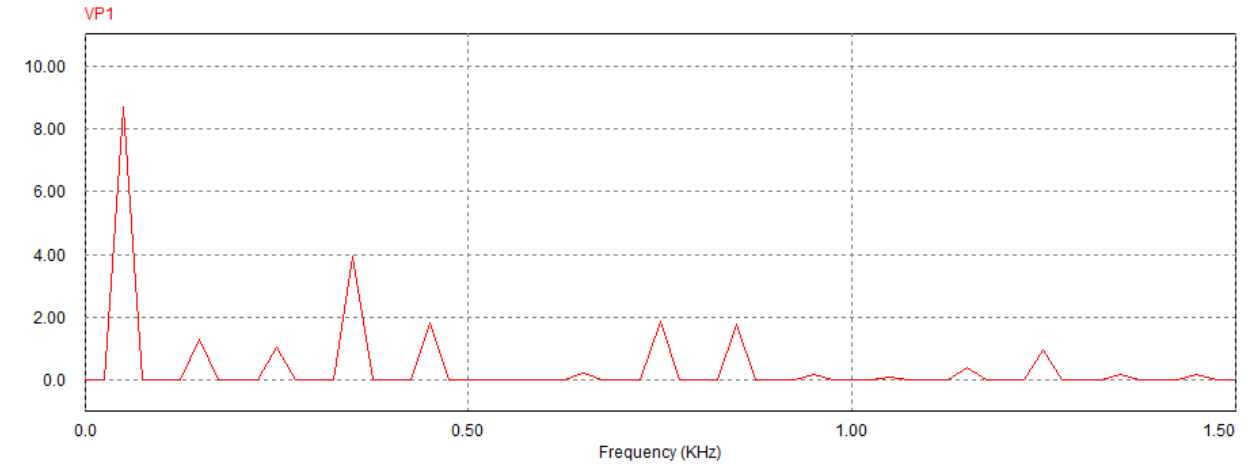


D) Middle Pulse : Centre: $90^{0,}$ Width: 33^{0}

Boundary Pulses: Centre: 45^{0} and 135^{0}, Width: 33^{0} each.



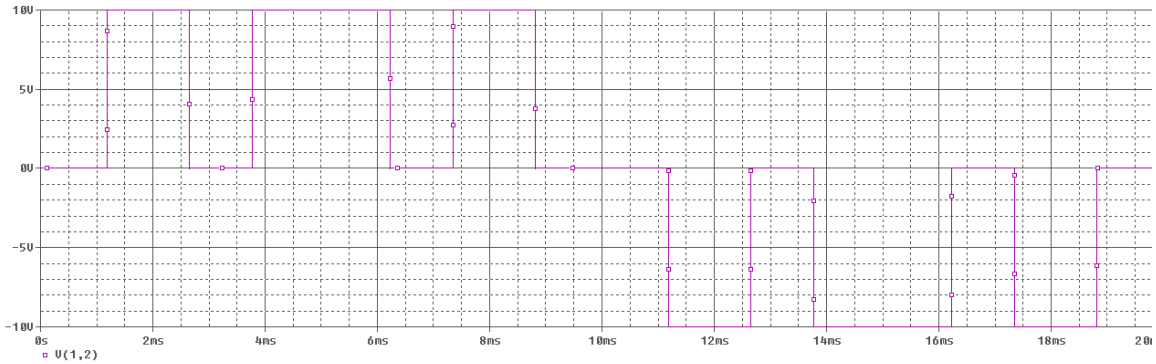


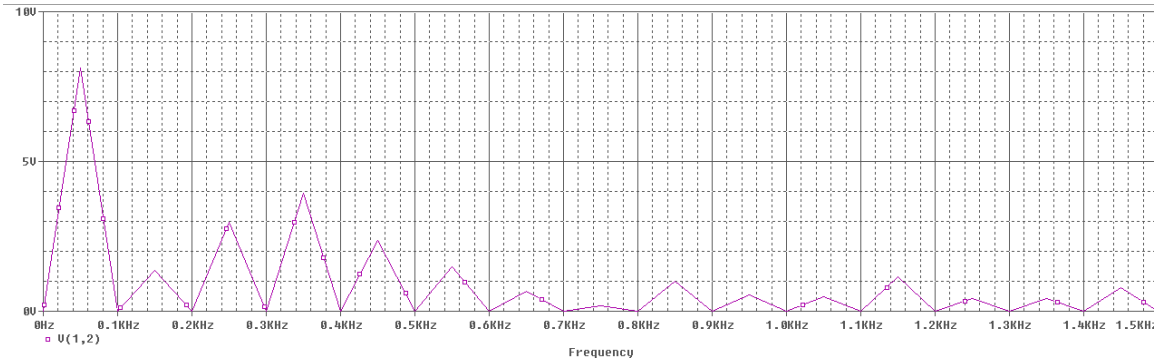


2. Sinusoidal PWM (SPWM): SPICE code

No. of pulses: 3

```
Vs 4 0 10V
Vy 4 3 0V
V_mod 15 0 AC 0 SIN ( 0 0.8V {fout} 0 0 0)
E_ABS 5 0 VALUE {ABS (v(15))}
.MODEL DMD D(IS=2.22E-15 BV=12000V CJO=1PF TT=0US )
.PARAM fout=50Hz p=3
S1 3 1 10 0 SMD
S2 2 0 10 0 SMD
S3 3 2 11 0 SMD
S4 1 0 11 0 SMD
D1 1 3 DMD
D2 0 2 DMD
D3 2 3 DMD
D4 0 1 DMD
R 1 2 22.5
.MODEL SMD VSWITCH (RON=0.001 ROFF=10E+6 VON=1V VOFF=0V)
E_ABM21 6 0 VALUE {IF (V(5)-V(7)>0, 1, 0)}
Vx 8 0 PULSE (0 1 0 1ns 1ns {1/(2*{fout})-2ns} {1/{fout}})
Vref 7 0 PULSE (1 0 0 {1/(2*{2*{p}*{fout}})} {1/(2*{2*{p}*{fout}})-1ns} 1ns
{1/{2*{p}*{fout}}})
E_ABM12 9 0 VALUE {1-V(8)}
E_MULT1 10 0 VALUE {V(8)*V(6)}
E_MULT2 11 0 VALUE {V(9)*V(6)}
.TRAN 1US 20MS 0 0.1US
.FOUR 60Hz 10 V(1,2)
.PROBE
.END
```





3. Comparative Results:

Table N0. 1

Harmonic No.	Multiple Pulse Width Modulation (MPWM)					Sinusoidal PWM (SPWM)	
	28-44-28	23-54-23	16-68-16	30-40-30	33-33-33	Mod. Index	
						0.8	0.9
1	9.1	9.3	9.6	9	8.7	8.2	9.2
3	0.12	0.8	1.68	0.56	1.28	1.2	1.8
5	0.96	1.19	1.81	0.93	1	3	2.2
7	3.31	2.23	0.6	3.6	3.9	4	3.5
9	1.14	0.66	0.72	1.34	1.76	2.4	2
11	1.75	2.3	1.37	-	0	1.5	1.5